

RGG : Reactor Geometry and Mesh Generator

RGG is an open source tool to generate several types nuclear reactor assembly/core geometry and mesh.

Approach

RGG consists of two tools:

1. Assygen: Generates a nuclear reactor assembly geometry and Cubit journal file to mesh this assembly.

A reactor assembly is described via a user defined input file that Assygen understands.

Step 1 & 2: Generating assembly geometry and meshing

Assygen input for the hexagonal assembly shown above can be found in the examples directory of the rgg source code. [Assygen input](#)

2. Coregen: Takes assembly geometries or meshes as input and copy/move/merge 's them into core as specified in the Coregen input file.

Step 3: Copy-move-merge-extrude assemblies and other mesh files to form the core mesh

Run 'make' and see [makefile](#) to generate the core model ([Coregen input](#).) shown above and understand the dependencies.

Examples

There are several tailor made [test examples](#) that can be run from the directory containing that test.

Users can run 'make' for creating all the assembly geometry files, all the assembly mesh files and the final core mesh in that test directory.

Some of the core models generated using RGG are presented below:

* VHTR *

Full VHTR core mesh and geometry models can be created using RGG tools.

The mesh model has 21M hexes, it takes 96mins and 3.5GB of RAM to generate the all assemblies and core mesh from scratch.

For this mesh model axial mesh interval (Z-direction) of 2 is used. The geometry model has ~33,000 volumes.

Isometric view of full VHTR core geometry (left), zoomed cross-sectional view of the top surface (center), further zoomed view of assemblies (right).

1/6th VHTR core geometry (left), closeup view of mesh (center), 1/12th VHTR core geometry (right).

*** PWR ***

The benchmark problem: ?MOX Fuel Loaded Small PWR Core? can be found on the website of Nuclear Reactor Analysis and Particle Transport Lab:

<http://nurapt.kaist.ac.kr/benchmark/>

1/4th PWR benchmark assembly consisting of 11,000 volumes takes 25mins and 0.9GB of RAM on a Linux workstation.

*** MONJU ***

Assygen is capable of creating assemblies with varying properties in axial direction.

It takes 18 mins and 2.2GB of RAM to generate a 2D top surface mesh (7M quad elements) of the full core MONJU reactor on a Linux workstation using RGG tools.

Top (left) and side view (center) of one of the MONJU hexagonal assemblies showing varying properties in axial direction.

Top view of a full core geometry visualized using CUBIT (right).

Building

See page [RGGFromScratch](#) for building all the dependencies and libraries required to setup RGG.

RGG is capable of creating geometries in ACIS or OCC geometry file format. This depends on the geometry configuration option used when building CGM. [see [CgmFromScratch](#)]